

C&D TECHNOLOGIES, INC.

Power Solutions

Installation and Operating Procedures For C&D Technologies TRUE Front Access TEL Series Batteries



**FOLLOW MANUFACTURER'S PUBLISHED INSTRUCTIONS WHEN
INSTALLING, CHARGING AND SERVICING BATTERIES.**

For additional information: www.cdtechno.com

Technical-Warranty Assistance, contact:

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Before handling cells or storing cell for future installation take time to read this manual. It contains information that could avoid irreparable damage to the battery and/or void product warranty.

General:

The purpose of this manual is to inform installers how to receive, install and maintain C&D Technologies front access batteries.

Battery Description:

The Valve Regulated Lead Acid (VRLA) battery is a minimal maintenance system utilizing an oxygen recombination cycle to minimize gassing and eliminate electrolyte maintenance. The dilute sulfuric acid electrolyte is immobilized by absorbent glass mat (AGM) separators. Each of the 2 VDC cells (6 cells per unit) in each unit has a unique self-resealing one way valve to relieve any excess pressure generated during overcharging conditions. Four six cell units in series make up a 24 cell 48VDC battery, two six cell units in series for a 12 cell 24VDC applications.

Table 1 - Installation Tools (minimum) required to be supplied by Installer

Safety Glasses for each installer
Insulated gloves (1 pair for each installer)
Digital Voltmeter
Terminal Prep Supplies (water, baking soda, cloth rag, brass bristle brush or scotch brite type pad, NO-OX-ID terminal grease)
Insulated Inch Pound Torque Wrench (up to 160 in lb)
Insulated 7/16" socket wrench for TEL12-105FS, TEL12-160F, TEL12-160FW, TEL12-180F & TEL12-210Fa models
Insulated 10mm socket wrench for TEL12-115FN/FNG & TEL12-145FW models
Insulated 13mm socket wrench for TEL12-105FN/SG/FNS, TEL12-155F/FG, TEL12-170F/FG, TEL12-190F/FG, TEL12-210F/FG models
Utility knife or diagonal cutter (for trimming protective covers and gas collection tubing if used)
Battery Numbers and String Letters/Numbers
Optional plastic apron, portable eyewash, spill kit and fire extinguisher (Class C)

See Section IV. Installation Instructions-for further descriptions.

Table 2 - Installation Hardware Included with each 12 Volt Battery

Model	Bus Bar Connector	Hardware Package (two SS Bolts & two SS washers)	Protective Terminal Cover	Lifting Handle	Gas Collection Plug Kit	Gas Collection Tubing Kit
TEL12-105FN/SG/FNS	(1) 15028536	8mm x 16 (1) 15028538	(1) 15028540	(2) 15028591	15028595*	15028596*
TEL12-115FN/FNG	(1) 15028537	6mm x 16 (1) 15028539	(1) 15028540	(2) 15028591	15028595*	15028596*
TEL12-145FW	(1) 30046795	6mm x 16 (1) 15028539	(1) 15028594	(2) 15029231	N/A	N/A
TEL12-155F/FG	(1) 15028593	8mm x 16 (1) 15028538	(1) 15028594	(2) 15028591	15028595*	15028596*
TEL12-160F	(1) 30046800	1/4-20 x 3/4 (1) 15028506	(1) 15029218	(2) 15029217	N/A	N/A
TEL12-160FW	(1) 30046795	1/4-20 x 3/4 (1) 15028506	(1) 15029218	(2) 15029217	N/A	N/A
TEL12-170F/FG	(1) 15028593	8mm x 16 (1) 15028538	(1) 15028594	(2) 15028591	15028595*	15028596*
TEL12-180F	(1)30046800	1/4-20 x 3/4 (1) 15028506	(1) 15029218	(2) 15029217	N/A	N/A
TEL12-190F/FG	(1) 15028593	8mm x 16 (1) 15028539	(1) 15028594	(2) 15028591	15028595*	15028596*
TEL12-210F/FG	(1) 15028593	8mm x 16 (1) 15028538	(1) 15028594	(2) 15028591	15028595*	15028596*
TEL12-210Fa	(1)30046800	1/4-20 x 3/4 (1) 15028506	(1) 15029218	(2) 15029217	N/A	N/A

*Models with "G" suffix only

Hardware, terminal protector, and bus bar indicated above is individually packaged within the insert on the top of the battery, inside the shipping carton of each 12 volt battery unit. Batteries ordered without cartons (bulk) do not include connector or hardware.

Table 3 - Post hardware torque values

Battery Models	Terminal Hardware Size	Typical Socket Required	Initial Torque	Maintenance Torque
TEL12-105FNS/FNSG, TEL12-155F/FG, TEL12-170F/FG, TEL12-190F/FG, TEL12-210F/FG	M8	13mm	160 in-lbs (18 N-m)	160 in-lbs (18 N-m)
TEL12-115FN/FNG, TEL12-145FW	M6	10mm	110 in-lbs (12.4N-m)	110 in-lbs (12.4N-m)
TEL12-160F, TEL12-160FW, TEL12-180F, TEL12-210Fa	1-4/20	7/16"	110 in-lbs (12.4N-m)	110 in-lbs (12.4N-m)

I. Safety

Installation and servicing of batteries should be performed or supervised by personnel knowledgeable of lead acid batteries standard safety practices i.e., personal and equipment safety precautions.

Safety Concerns (Please reference C&D Material Safety Data Sheet document L-84 for additional information which is available directly from www.cdtechno.com)

- **Electrical Hazards**

Battery systems present a risk of electrical shock and high short circuit current. Remove any metal objects (e.g. watches and rings), use properly insulated tools, and wear eye protection and rubber gloves. Observe circuit polarities, use a voltmeter to check potentials before making connections and do not make or break live circuits without following all proper safety precautions.

- **Disposal**

Lead Acid Batteries are to be recycled. VRLA batteries contain lead and immobilized dilute sulfuric acid. Dispose of in accordance with Federal, State and local regulations. Do not dispose of in a landfill, lake or other unauthorized location. For assistance contact C&D at www.cdtechno.com

- **Chemical Hazards**

Any liquid emission from a battery may be electrolyte which contains dilute sulfuric acid this is harmful to the skin and eyes, is electrically conductive and is corrosive. If electrolyte contacts the skin, wash immediately and thoroughly. If electrolyte enters the eyes, promptly flush eyes with water and seek medical attention. Neutralize spilled electrolyte with a solution of 1 lb. bicarbonate of soda (baking soda) to 1 gallon of water.

- **Fire, Explosion and Heat Hazards**

Batteries can contain an explosive mixture of hydrogen gas which can vent under overcharging conditions. Do not smoke or cause sparks in the vicinity of the battery. Do not install and charge batteries in a sealed container. Mount the individual batteries with a minimum of 0.5" between units. If contained, assure the container or cabinet and room have adequate ventilation to prevent accumulation of potentially explosive vented gas. Refer to the current issue of the National Electric Code (NEC) and other applicable building codes. Please note that for sealed cabinets with VRLA gas removal provisions, the C&D TEL Series batteries with gas collection (G suffix) and the optional tubing kit can be utilized (see Diagram in Section V of this document)

- **Caution**

Do not attempt to remove battery vents or add water as this presents a safety hazard and voids the warranty. Wash hands after any contact with the battery lead terminals.

II. Receiving Instructions

Upon receipt, inspect the batteries for physical damage to the containers and terminals. If found, a claim must be filed with the carrier within 10 days. Also check the packing slip to make sure all material has arrived. The batteries are shipped fully charged. Their Open Circuit Voltage (OCV) should not be below 12.48 volts per 12 volt unit.

III. Storage Instructions

Store batteries in a clean, dry, cool area away from radiant heat sources. Recharge batteries in storage at least every 6 months or before their OCV declines to 12.48 VDC. Follow instructions as outlined in Section VI. Freshening Charge.

IV. Installation Instructions-Required Installation Tools & Room Equipment

At a minimum, the following tools and equipment are required to install VRLA batteries. A digital voltmeter, insulated 7/16", 10mm or 13mm socket wrench (depending on product model), inch pound torque wrench (160 in. lb. maximum), rubber gloves, safety glasses for normal maintenance, full face shield for load testing, optional plastic apron, portable eyewash, spill kit and fire extinguisher (Class C). If gas collection tubing is connected, a knife or diagonal cutter will be needed to cut the inter-battery tubing to length.

Optional test equipment, depending on the type of checkout to be performed includes; micro-ohm meter, ohmic test set, 100 amp momentary load test set or system load bank.

Typically for Telecom applications, four individual batteries are connected in series to form a higher voltage string of batteries (e.g. 4 each 12 volt batteries connected in series form a 48VDC battery system). Refer to Figure 3 for a 48 VDC series connected battery string using 12 volt front access batteries.

Two or more strings may be connected in parallel to increase the total capacity of the system (e.g. two strings of 48 volt 115 ampere-hour batteries connected in parallel make a 48 volts 230 Amp hour battery. Refer to Figure 5 for parallel connected front access batteries.

Warranty Date Code C&D's front access batteries date code is located on the front panel of the battery as a four digit number, MM-YY

Front access batteries are heavy, typically over 100 pounds each. Make sure proper lifting and moving arrangements are in place to safely handle this weight and have been considered before traveling to the site. Do not attempt to lift batteries alone.



Figure 4 – Single -48 volt string configuration (typical)

Series -48VDC connection of individual front access batteries

Step 1. If installing in a multiple tier rack or cabinet arrangement, always begin with the lowest shelf, string A, place each the individual front access batteries on the shelf (typically 4 per level) with approximately 1/2 inch spacing between the individual units. All the batteries should be placed with terminals to the front of the rack / shelf. Remove and save terminal protectors.

Step 2. C&D recommends, prior to connection of inter-unit bus bars and lugged cables, the battery terminals and all contact surfaces should be neutralized, cleaned, lightly brushed with a brass bristle brush or scotch brite type pad and lightly coated with protective No-Ox-Id terminal grease. Use caution to avoid fully removing coating and exposing copper insert.

Step 3a. Starting at the battery on the right, which is to be the positive (+) output, label it as number 1 and then label the adjacent batteries (right to left) in ascending numerical order 2, 3 & 4.

Step 3b. If more than one 48 VDC string is within the enclosure, number the additional batteries the same way. Identify the bottom string as string A with the string above if present as string B and soon.

Step 4. Using the provided inter-unit bus bar and hardware (bolt and washer), connect between battery 1's negative (-) terminal to battery 2's positive (+) terminal as shown in Figure 4. Tighten bolt washer assembly hand tight.

Step 5. Repeat, using the provided inter-unit bus bar and hardware (bolt and washer), connect between battery 2's negative (-) terminal to battery 3's positive (+) terminal. Tighten bolt washer assembly hand tight.

Step 6. Repeat, using the provided inter-unit bus bar and hardware (bolt and washer), connect between battery 3's negative (-) terminal to battery 4's positive (+) terminal. Tighten bolt washer assembly hand tight.

Step 7. Torque each of the above bolt washer assemblies as per the inch-pound specifications in Table 3 for the appropriate product.

Step 8. Following the rack or cabinet manufacturers cabling guidelines attach the lugged power lead connections to positive (+) of battery 1 and negative (-) battery 4 terminals verifying proper polarities are observed.

Step 9. Torque all remaining bolt washer assemblies as per the inch-pound specifications in Table 3 for the appropriate product.

Step 10. Repeat for additional battery string if multiple strings are present.

Step 11. Install all protective terminal covers and use a utility knife or diagonal cutter to trim the cover as needed allowing for proper cable routing.

Step 12. Verify charging equipment is set for proper float voltage of 2.25 to 2.30 volt per cell at 77°F at the battery terminals (54 to 55.2Vdc for a nominal 48 volt battery).



Figure 5 – Series +24 volt string configuration (typical) 2 strings to be in parallel shown

Series +24VDC connection of individual front access batteries

Step 1. If installing in a multiple tier rack or cabinet arrangement, always begin with the lowest shelf, string A & B, place each the individual front access batteries on the shelf (typically 4 per level) with approximately 1/2 inch spacing between the individual units. All the batteries should be placed with terminals to the front of the rack / shelf. Remove and save terminal protectors.

Step 2. If supplied by the rack/cabinet manufacturer, place a safety shield in the center of the tray between adjacent 24 volt battery strings.

Step 3. C&D recommends, prior to connection of inter-unit bus bars and lugged cables, the battery terminals and all contact surfaces should be neutralized, cleaned, lightly brushed with a brass bristle brush or scotch brite type pad and lightly coated with protective No-Ox-Id terminal grease.

Step 4a. Starting at the battery on the far right of the tray/shelf, which is to be the positive (+) output, label it as number 1 and then label the adjacent battery to the left as battery number two, string A. Repeat the numbering procedure for the adjacent string (next two batteries to the left), string B.

Step 4b. If more than two 24 VDC strings is within the enclosure, number these batteries the same way. Identify the bottom tray as string A and B with the strings above as string C and D and so on

Step 5. Using the provided inter-unit bus bar and hardware (bolt and washer), connect between String A, battery 1's negative (-) terminal to String A, battery 2's positive (+) terminal as shown in Figure 5. Tighten bolt washer assembly hand tight.

Step 6. Torque each of the above bolt washer assemblies as per the inch-pound specifications in Table 3 for the appropriate product.

Step 7. Following the rack or cabinet manufacturers cabling guidelines to attach the lugged power lead connections to positive (+) of String A, battery 1 and negative (-) of String A, battery 2 terminals verifying proper polarities are observed.

Step 8. Torque each of the above bolt washer assemblies as per the inch-pound specifications in Table 3 for the appropriate product.

Step 9. Repeat above steps for String B and each of any remaining battery strings.

Step 11. Install all protective terminal covers and use a utility knife or diagonal cutter to trim the cover as needed allowing for proper cable routing.

Step 12. Verify charging equipment is set for proper float voltage of 2.25 to 2.30 volt per cell at 77°F at the battery terminals (27 to 27.6 VDC for a nominal 24 volt battery).

Parallel Connection of individual strings of batteries

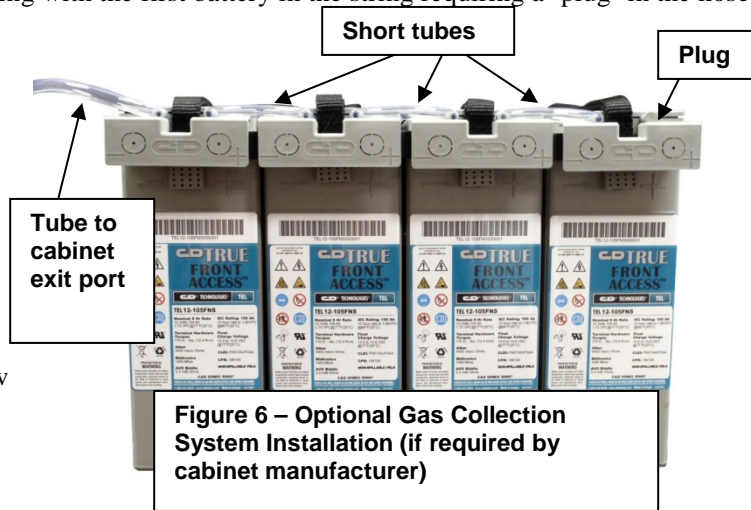
C&D recommends each individual battery string be cabled separately to a common junction point or box. Each string may also contain a separate fuse or disconnect switch to facilitate maintenance. The parallel connections should be completed only when the charger and load are not connected to the battery output circuit or battery string voltage should be matched to within 0.5 volts before the connection is made and should be performed only by qualified technicians familiar with live battery connections. The battery strings must not be "daisy chained" in parallel.

V. Optional Gas Collection System Installation (tubing kit PN 15028596)

TEL Series Models with 'G' in the product suffix (i.e. TEL12-105FN5G) include a gas collection system feature which allows the hydrogen and oxygen gases that may vent from the battery to be directed to a specific cabinet exit location by the installation of 6mm or 1/4" ID PVC tubing. This tubing daisy chains from one battery to the next in the string with the first battery in the string requiring a 'plug' in the hose barb port above the positive terminal of the battery (shown in Figure 6).

(Note that each battery ships with a plug in this right side port. Installer should remove any remaining plugs to allow for tubing connection)

Individual tubes are cut by the installer (each short tubing piece is approx 6" in length) and are routed from battery to battery as shown in Figure 6 (please make sure that the tubing is not kinked so gases can flow freely in the tubing). A final system collection tube, which varies in length, is connected to the hose barb port above the negative terminal on the left most battery unit. This tube should be routed per the cabinet manufacturer's instructions.



Special Note: if the gas collection system is not required and/or utilized, the factory installed plug in the right port of each 12 volt battery can be removed or can remain in place. NEVER install a plug in both battery ports or the left side port since this will not allow the battery to vent any excess pressure and could cause an unsafe condition.

VI. Freshening Charge

When the batteries have been in storage or transit for an extended period, over 6 months or if OCV's are below 12.48 volts or when the number of cells in series is greater than 24, it is recommended the battery system be given a freshening charge at 2.4 volts average per cell for 24 hours prior to final installation. This will ensure higher initial performance and will reduce the time period required for the cells to achieve proper voltage balance between the individual units. Normally freshening charges are only necessary if batteries were in a warehouse at 77°F in excess of 6 months or the open circuit voltage of the unit has declined to less than 12.48 VDC.

Additionally, if the batteries are being deployed into a system having a string voltage greater than 48Vdc, C&D strongly recommends the entire string be given a 2.4 volts average per cell charge prior to installation. This will ensure the closest possible voltage balance between the individual units in the string.

VII. Float Charging

Following the freshening charge (if necessary) the battery system should be placed on "float" charge at between 2.25 volts per cell and 2.30 volts per cell average (approximately 13.5 to 13.8 volts/unit average for 12 volt units at 77°F). When temperatures other than 77°F (25°C) temperature compensated charging may be needed.

Refer to technical bulletin 41-2128 "Charging Valve Regulated Lead Acid Batteries" for additional information www.cdtechno.com/resource/support_doc.html

VIII. Initial Installation Data

The following initial installation data should be maintained on site:

- Date and Initial open circuit voltage of unit(s) at time of delivery to the site.
- Freshening charge records, if performed.
- Initial torque value used for connections.
- Overall system float voltage across battery terminals.
- Individual unit float voltage.
- Internal Ohmic value of each unit.
- Connection resistances.
- Float current.

IX. Periodic Maintenance

These VRLA batteries are maintenance free with respect to the electrolyte. However, the charging voltage, temperature, performance and connection resistances must be periodically monitored and any necessary corrective actions taken if irregular values are observed to assure reliable standby power when required.

Quarterly Inspection

- Measure and record the system total float charging voltage at the battery terminals
- Record the charger on charge output current and voltage
- Record the ambient temperature and condition of ventilation equipment
- Visually inspect the batteries and rack for general appearance, cleanliness or any irregularity.
- If gas tubing provisions are utilized, check for any obstructions in the tubing which would prevent the free flow of gases thru the exit point.

Semiannual Inspection

- Repeat the quarterly checks
- Record the on charge voltage of each unit
- Optionally perform and record Ohmic checks for trending purposes

Yearly and Initial Inspection

- Repeat the semiannual checks
- Inspect all connections to ensure integrity.

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